



## ATOP-R&D

### Human Factors Newsletter # 05-22

November 13, 2005 – November 26, 2005

#### Articles in this newsletter:

- *Technical Note: Human Factors Guidance for the Use of Handheld, Portable, and Wearable Computing Devices*
- *Flight Plan 2006-2010*
- *Technical Center Reports*
- *En Route Information Display System*
- *Unmanned Aircraft*
- *Human Factors Reports*
- *Calendar*

**Technical Note:** Report title: *Human Factors Guidance for the Use of Handheld, Portable, and Wearable Computing Devices*. Carolina Zingale, L-3 Communications, Titan Corporation, Vicki Ahlstrom, ATO-P, Bonnie Kudrick, L-3 Communications, Titan Corporation. (DOT/FAA/CT- 05/15)

#### **Executive Summary**

This report provides human factors guidance for the selection and use of handheld, portable, and wearable computing devices, including personal digital assistants (PDAs), tablet computers, and to a more limited extent, head-mounted display systems. These systems require different usage guidelines than standard desktop computing systems because of their size, portability, human-computer interface (HCI) designs, and intended work environments.

To optimize the selection and use of equipment for a specific job function, a detailed understanding of the user, user needs and goals, and the work environment is essential. Often, Human Factors Specialists (HFSs) conduct task analyses to obtain information about users and their environments by observing them as they perform their jobs in their normal work settings. Task analyses were beyond the scope of this project. However, we were able to conduct structured interviews with some maintenance specialists who provided us with insight on the environmental and task-related factors that would affect device selection.

A primary human factors consideration for a handheld, portable, or wearable device involves the device's physical or ergonomic characteristics. Users must be able to hold, interact with, transport, or wear the device, possibly for extended periods of time. The device must provide the capabilities users require while not interfering with their primary task responsibilities. These devices must also withstand a more stringent set of environmental stressors than their desktop counterparts. They must be rugged (resistant to damage when bumped into or dropped), water resistant, and operate in a wide range of temperatures.

The HCI must be critically evaluated to select a device that best meets user needs. Different devices may use keyboards, touch screens, or speech as their primary means of interaction. Display sizes and characteristics also vary across devices. The input device that is most appropriate depends on the task. For example, if the user needs to access documents and manuals or view images, a device with a high resolution display and a large screen will result in better readability.

PDAs, Blackberrys<sup>®</sup>, and smart phones are small in size and easily portable. They are most useful for accessing short lists of data, menus, and checklists, and for allowing limited mobile data entry or e-mail access. Due to their small screen size, they are less useful for accessing and viewing detailed text or images.

Tablet computers are similar to laptop computers in size and weight. Their screen size is adequate for allowing users to access detailed documents and images, but many of them also rely on touch screen interaction. Since the tablet computer has similar functionality to a laptop, it allows the user the ability to access a greater number of applications than smaller portable devices.

A drawback of both PDAs and tablet computers is that users need to hold the devices or place them on a surface to use them. Wearable devices provide an alternative, allowing users increased hands-free operation. However, these devices are still in the early stages of development and use, and a number of problems have been identified with the systems that do exist. The weight, size, and placement of the device on the body must be considered because muscle strain and difficulties with posture and gait can result. In addition, head-mounted wearable systems that utilize monocular viewing displays can cause visual disorientation and balance problems.

The suitability of any device depends on the application for which it is intended, the environment in which it is to be used, and the characteristics of the user. A human factors evaluation should be conducted with representative users performing representative tasks to determine which device best meets user needs.

*This research activity supports the Administrator's Flight Plan Goal for Organizational Excellence, Objective 1: Make the organization more effective with stronger leadership, increased commitment of individual workers to fulfill organization-wide goals, and a better prepared, better trained, safer, diverse workforce.*

Point of Contact: V. Ahlstrom, WJHTC

**Flight Plan 2006-2010:** The FAA Administrator has announced that the revised Flight Plan 2006-2010 is now available by pointing to the FAA's main Web site at <http://www.faa.gov/>

**Technical Center Reports:** William J. Hughes Technical Center personnel have implemented a new method of distributing products to interested parties through the Internet. A message is sent out as follows: "You are receiving this notification as a courtesy from the NAS Human Factors Group of the FAA, William J. Hughes Technical Center, Atlantic City International Airport, NJ. If you wish to be removed from the notification list, please reply to this note with a "please remove" in the subject line." *This research activity supports the Administrator's Flight Plan Goal for Organizational Excellence, Objective 3: Make decisions based on reliable data to improve our overall performance and customer satisfaction.* (E. Stein, WJHTC)

**En Route Information Display System (ERIDS):** In November, 2005, William J. Hughes Technical Center personnel will begin collecting data at Houston Air Route Traffic Control Center concerning current use and application of the ERIDS. This is in line with program direction regarding an evaluation of current benefits derived from the use of ERIDS for displaying information. A part of this effort will be the application of best practices to recommendations concerning how controllers may use the system more effectively to obtain information they need to move traffic more efficiently in the en route environment. *This research activity supports the Administrator's Flight Plan Goal for Greater Capacity, Objective 3: Increase on-time performance of scheduled carriers.* (R. Sollenberger, WJHTC)

#### **Unmanned Aircraft:**

- On October 30-November 2, 2005, Kevin Williams traveled to Daytona Beach, FL to attend the first annual conference on the commercialization of unmanned aircraft systems. He presented a paper entitled "Human Factors Implications of Unmanned Aircraft Accidents: Control Problems". The conference brought together representatives from academia, industry, and the government to discuss barriers to, and benefits associated with the commercialization of unmanned aircraft systems.

- On November 7, 2005, Kevin Williams traveled to Dallas, TX to participate in American Society for Testing and Materials (ASTM) F38 working group discussions of FAA rulemaking activity associated with unmanned aircraft systems. ASTM is a standards-making organization composed of industry and government entities. The F38 working group focuses on unmanned aircraft systems and the development of standards to assist their incorporation into the National Airspace System.

- On November 15-16, 2005, Kevin Williams visited the headquarters of Aerovironment Inc. in Simi Valley, CA to tour their facilities and receive a briefing on their development of unmanned aircraft systems. Of particular interest is their work on new types of control interface architectures for their systems. Two interface designs have been developed by Aerovironment. The first was constructed to control their long-endurance aircraft such as the Helios solar-powered aircraft, and Global Observer, which is an aircraft that runs on fuel cell technology and is intended to stay in the air for weeks at a time. The second interface design was created for control of their small unmanned aircraft such as the Raven, which is flown by the U.S. military in Iraq. This interface was created to relieve the operator/pilot from the requirement for extended training in learning to operate the system. Aerovironment is the primary supplier of small unmanned aircraft systems for the U.S. military.

*This research activity supports the Administrator's Flight Plan Goal for Increased Safety, Objective: Reduce the number of fatal accidents in general aviation.*

Point of Contact: K. Williams, CAMI

**Human Factors Reports Available:** The FY 2005 Aviation Maintenance, General Aviation, Vertical Flight, and Unmanned Aerial Vehicle (UAV) Human Factors annual reports are now available. At the end of each fiscal year, investigators submit a brief five-page summary of the project's results and significant accomplishments. These reports provide sponsors a quick assessment of progress and help them determine whether a project should receive additional funding.

To view the reports, please point to the following links:

FY05 Aviation Maintenance report: <http://www.hf.faa.gov/docs/508/docs/AvMaint05.pdf>

FY05 General Aviation Human Factors report: <http://www.hf.faa.gov/docs/508/docs/GA05.pdf>

FY05 Vertical Flight Human Factors report: <http://www.hf.faa.gov/docs/508/docs/VF05.pdf>

FY05 UAV Human Factors report: <http://www.hf.faa.gov/docs/508/docs/UAV05.pdf>

For additional information about other project deliverables, quarterly reports, or other relevant information, please point to the following websites:

Aviation Maintenance Human Factors program:

<http://www.hf.faa.gov/hfmaint/Default.aspx?tabid=275>

General Aviation Human Factors program: <http://www.hf.faa.gov/ga.htm>

Vertical Flight Human Factors program: <http://www.hf.faa.gov/vertical.htm>

*This research activity supports the Administrator's Flight Plan Goal for Organizational Excellence, Objective 3: Make decisions based on reliable data to improve our overall performance and customer satisfaction.*

Point of Contact: W. Krebs, ATO-P R&D

***More information on human factors research can be found at  
the FAA Human Factors (ATOP-R&D) web site: <http://www.hf.faa.gov>***

Paul Krois  
FAA (ATO-P R&D Human Factors)



**November 28-30, 2005** – European Aviation Conference, Nice, France  
<http://www.everestevents.co.uk/events.asp?eventID=39>

**November 28 - December 1, 2005** – I/ITSEC 2005 (Interservice/Industry Training, Simulation and Education Conference), Orange Country Convention Center, Orlando, FL  
<http://www.adlnet.org/news/articles/337.cfm>

**November 29 – December 1, 2005** – FAA New Technologies Workshop, Sheraton National Hotel, Arlington, VA <http://www.cmpmeetings.com/faaafs> , [csmith@cmpmeetings.com](mailto:csmith@cmpmeetings.com)

**December 6-8, 2005** – US Air Force T&E Days, Gaylord Opryland Hotel, Nashville, TN  
<http://www.aiaa.org/content.cfm?pageid=230&lumeetingid=1297>

**December 6-8, 2005** – NASA Sixth Annual Risk Management Conference, Disney Coronado Resort, Orlando, FL <http://rmc.nasa.gov/>

**January 9-12, 2006** - 44th AIAA Aerospace Sciences Meeting and Exhibit, Reno Hilton, Reno, NV <http://www.aiaa.org/>

**January 21-25, 2006** – ASHRAE Winter Meeting and Expo, Chicago, IL  
<http://www.ashrae.org/template/AssetDetail/assetid/45794>

**January 22-26, 2006** – TRB 85<sup>th</sup> Annual Meeting, Washington, DC <http://trb.org/calendar/>

**January 23-27, 2005** - S-18 Safety Assessment for Airborne Systems & Equipment San Antonio, TX, [lemon@sae.org](mailto:lemon@sae.org)

**February 9-10, 2006** - Swinburne University Symposium on Safety Management and Human Factors Symposium, Melbourne, Australia [janca@groupwise.swin.edu.au](mailto:janca@groupwise.swin.edu.au)  
<http://www.swin.edu.au/aviation/forms/2006SwinburneSymposiumCallforPapers.pdf>

**February 21-26, 2006** – Asian Aerospace 2006, Changi Exhibition Centre, Singapore  
[www.asianaerospace.com](http://www.asianaerospace.com)

**February 26-28, 2006** – Heli-Expo, Dallas, TX <http://www.heliexpo.com>

**February 28 – March 1, 2006** – 31<sup>st</sup> Annual FAA Aviation Forecast Conference, Wash, DC  
[http://www.faa.gov/news/conferences/aviation\\_forecast\\_2006/](http://www.faa.gov/news/conferences/aviation_forecast_2006/).

**March 12-14, 2006** – AirCargo 2006, Sheraton Bal Harbour, FL  
<http://www.aircargokonference.com>

**March 13-15, 2006** – Flight Safety Foundation 18<sup>th</sup> Annual European Aviation Safety Seminar, Athens, Greece <http://www.flightsafety.org/seminars.html#eass>

**March 20-23, 2006** – 16<sup>th</sup> Annual AAMI/FDA International Conference on Medical Device Standards and Regulation, Hyatt Regency, Reston, VA  
<http://www.aami.org/meetings/isc/index.html>

**March 22 - 25, 2006** - Society for Behavioral Medicine Annual Meeting and Scientific Sessions, San Francisco, CA [www.sbm.org/annualmeeting/index.html](http://www.sbm.org/annualmeeting/index.html)

**March 23-25, 2006** - 17th Annual International Women in Aviation Conference, Opryland Hotel Nashville, TN <http://www.wai.org/>

**March 23-27, 2005** – IA Summit 2006, Hyatt Regency, Vancouver, BC, Canada  
<http://www.iasummit.org/>

**March 28-30, 2006** – Aviation Industry Expo, Las Vegas, NV  
<http://www.aviationindustryexpo.com>

**April 4-10, 2006** – Sun ‘n Fun, Lakeland, FL <http://www.sun-n-fun.org/content/>

**April 6-7, 2006** – National Human Capital Summit, Chicago Marriott Downtown, Chicago, IL  
[http://www.humancapitalinstitute.net/conference\\_national.html](http://www.humancapitalinstitute.net/conference_national.html)

*April 18-20, 2006 – FAA Aviation Safety Programs Conference, Grand Hyatt Hotel, Denver, CO*  
<http://www.aviationsafetyconference.com>

**April 22-27, 2006** – CHI 2006, Montreal, Quebec, Canada  
<http://www.chi2006.org/call/hcioverviews.php>

**April 23-28, 2006** - Avionics Systems Division Meeting, New Orleans, LA (TBD)  
[lemon@sae.org](mailto:lemon@sae.org)

**April 25-27, 2006** – Maintenance, Repair & Overhaul (MRO) Conference & Exhibition, Phoenix Civic Plaza, Phoenix, AZ <http://www.aviationnow.com/conferences/mromain.htm>

**May 1-4, 2006** - 47th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference; 14th AIAA/ASME/AHS Adaptive Structures Conference; 7th AIAA Gossamer Spacecraft Forum; 2nd AIAA Multidisciplinary Design Optimization Specialist Conference; 1st AIAA Non-Deterministic Approaches Conference, Hyatt Regency Newport, Newport, RI <http://www.aiaa.org/>

**May 9-11, 2006** – Flight Safety Foundation 51<sup>st</sup> Annual Corporate Aviation Safety Seminar, Phoenix, AZ <http://www.flightsafety.org/seminars.html#eass>

**May 14-18, 2006** - 77<sup>th</sup> Annual Scientific Meeting of the Aerospace Medical Association, Caribe Royale Hotel, Orlando, FL <http://www.asma.org/>

**May 15-16, 2006** – DoD TAG, Las Vegas, NV <http://hfetag.dtic.mil/meetschl.html>

*May 15-16, 2006 – ASTM F38 Unmanned Aircraft Systems Committee Workshop, Sheraton Centre Toronto; Toronto, ON CAN <http://www.astm.org/>*

**May 17-19, 2006** – 17<sup>th</sup> International Conference on Heating and Ventilation, Prague, Czech Republic <http://www.acv2006.cz>

**May 22-24, 2006** - 9th IFAC Symposium on Automated Systems Based on Human Skill And Knowledge, Nancy, France <http://www.cdc.gov/niosh/exhibits.html>

**May 25-28, 2006** – American Psychological Society 18<sup>th</sup> Annual Convention, New York Marriott Marquis, New York City, NY <http://www.psychologicalscience.org/convention/>

**June 8-10, 2006** – NTSB Bar Association Annual CLE Conference, NTSB Conference Center, L'Enfant Plaza, Wash, DC <http://www.ntsbbbar.org/>

**June 11-14, 2006** – The American Society of Safety Engineers Safety 2006 Conference, Washington State Convention and Trade Center, Seattle, WA  
<http://www.asse.org/2006pdcallforpapers.pdf>

**June 12-16, 2006** – UPA 2006 – 15<sup>th</sup> Annual Conference, Broomfield, CO  
[http://www.usabilityprofessionals.org/conferences\\_and\\_events/upa\\_conference/2006/](http://www.usabilityprofessionals.org/conferences_and_events/upa_conference/2006/)

**June 24-26, 2006** – AAMI Conference & Exposition, Wash, DC  
<http://www.aami.org/proposals/index.html>

**June 24-28, 2006** – ASHRAE Annual Conference, Quebec, Canada <http://www.ashrae.org/>

**June 26-29, 2006** - [General Aviation Technology Conference](#) , Hyatt Hotel, Wichita, Kansas,

**July, 2006** - 26th International Congress of Applied Psychology, Athens, Greece  
[dgeorgas@dp.uoa.gr](mailto:dgeorgas@dp.uoa.gr) ,  
[http://www.erasmus.gr/dynamic/conventions.asp?conv\\_id=21r/dynamic/conventions.asp?conv\\_id=21](http://www.erasmus.gr/dynamic/conventions.asp?conv_id=21r/dynamic/conventions.asp?conv_id=21)

**July 10-14, 2006** – IEA 2006, 16<sup>th</sup> World Congress on Ergonomics, Maastricht, The Netherlands  
<http://www.iea2006.org/>

**July 24-30, 2006** – EAA AirVenture, Oshkosh, WI <http://www.airventure.org/>

**August 10-13, 2006** – American Psychological Association Annual Meeting, New Orleans, LA  
<http://www.apa.org/convention05/future.html>

**August 21-24, 2006** - AIAA Modeling and Simulation Technologies Conference and Exhibit.  
Keystone Resort and Conference Center, Keystone, CO  
<http://www.aiaa.org/content.cfm?pageid=1>

**August 21-24, 2006** - AIAA Guidance, Navigation, and Control Conference and Exhibit,  
Keystone Resort and Conference Center, Keystone, CO  
<http://www.aiaa.org/content.cfm?pageid=1>

**September 6-8, 2006** - 11th AIAA/ISSMO Multidisciplinary Analysis and Optimization  
Conference, Renaissance Portsmouth, Portsmouth, VA,  
<http://www.aiaa.org/content.cfm?pageid=1>

**September 10-14, 2006** - 54th International Congress of Aviation and Space Medicine,  
Bangalore, India. A preliminary registration form may be found at <http://www.isam-india.org/conference44/newreg.php>.

**September 20-22, 2006** – HCI-Aero 2006, Seattle, WA <http://www.eurisco.org/hci-aero2006>

Note: Submission Deadlines:

15th March 2006 - Full Research Papers

15 April 2006 - Industry Papers

15 April 2006 - Early Stage Research Papers

15 April 2006 - Panels, Workshops

15 April 2006 - Posters and Demos

**September 26-27, 2006** – AIAA Aviation Technology, Integration and Operations Conference,  
Hyatt Regency, Wichita, KS <http://www.aiaa.org/content.cfm?pageid=1>

**October 15-19-2006** – Digital Avionics Systems Conference, Hilton Portland, Portland, OR  
<http://www.dasconline.org/>

**September 25-27, 2006** - 6th AIAA Aviation Technology, Integration and Operations Forum,  
Hyatt Regency Wichita, Wichita, KS <http://www.aiaa.org/content.cfm?pageid=1>

**October 23-25, 2006** – 44<sup>th</sup> Annual SAFE Symposium, Reno Hilton Hotel, Reno, NV  
<http://www.safeassociation.org/symposium.htm>

**October 23-26, 2006** - DoD Maintenance Symposium & Exhibition, Reno Hilton, Reno,  
Nevada <http://www.sae.org/events/conferences/aerospace/>

**November 9-11, 2006** – AOPA Expo 2006, Palm Springs, CA  
<http://www.aopa.org/expo/2005/virtual/>

*November 13-14, 2006 ASTM F38 Unmanned Aircraft Systems Committee Workshop, Hyatt  
Regency, Atlanta, GA <http://www.astm.org/>*



**January 8-11, 2007** - 45th AIAA Aerospace Sciences Meeting and Exhibit, Reno Hilton, Reno, NV <http://www.aiaa.org/content.cfm?pageid=1>

*May 21-22, 2007 - ASTM F38 Unmanned Aircraft Systems Committee Workshop, Waterside Convention Center, Norfolk, VA <http://www.astm.org/>*

**July 22-27, 2007** – 12<sup>th</sup> HCI International, Beijing, China <http://www.hcii2007.org/>

*Note: Calendar events in Italics are new since the last Newsletter*



Comments or questions regarding this newsletter?  
Please contact Bill Berger at (334) 271-2928  
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